

Exhibit #4

Shows that if a tower antenna
is about 50 meters

^{- 70}
From residences that
ground power density is
low enough so

still 20 or so channels
are possible if limit is
 $0.05 \mu W/cm^2$

CELLULAR INDUSTRY & SYSTEM

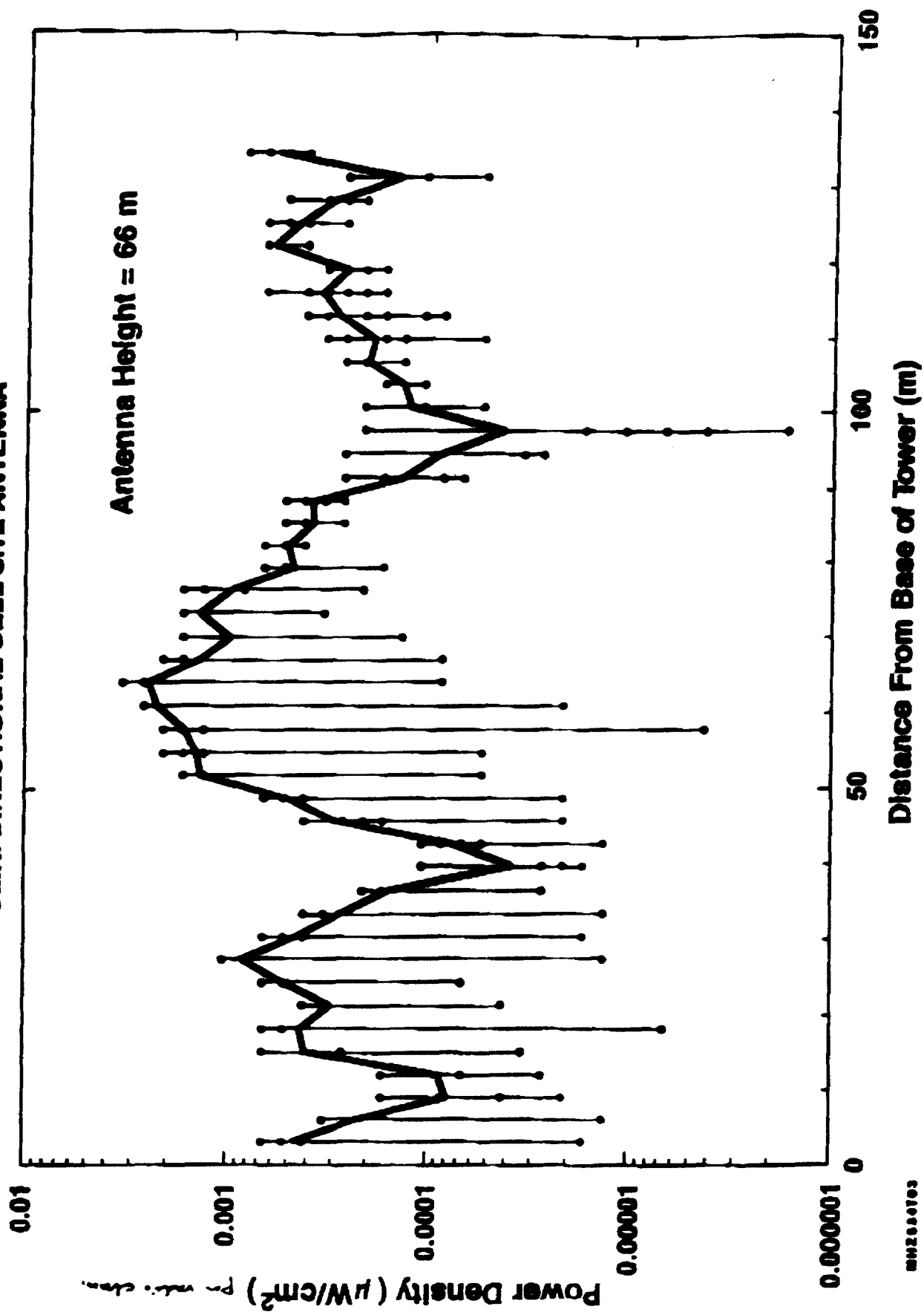
Presented By

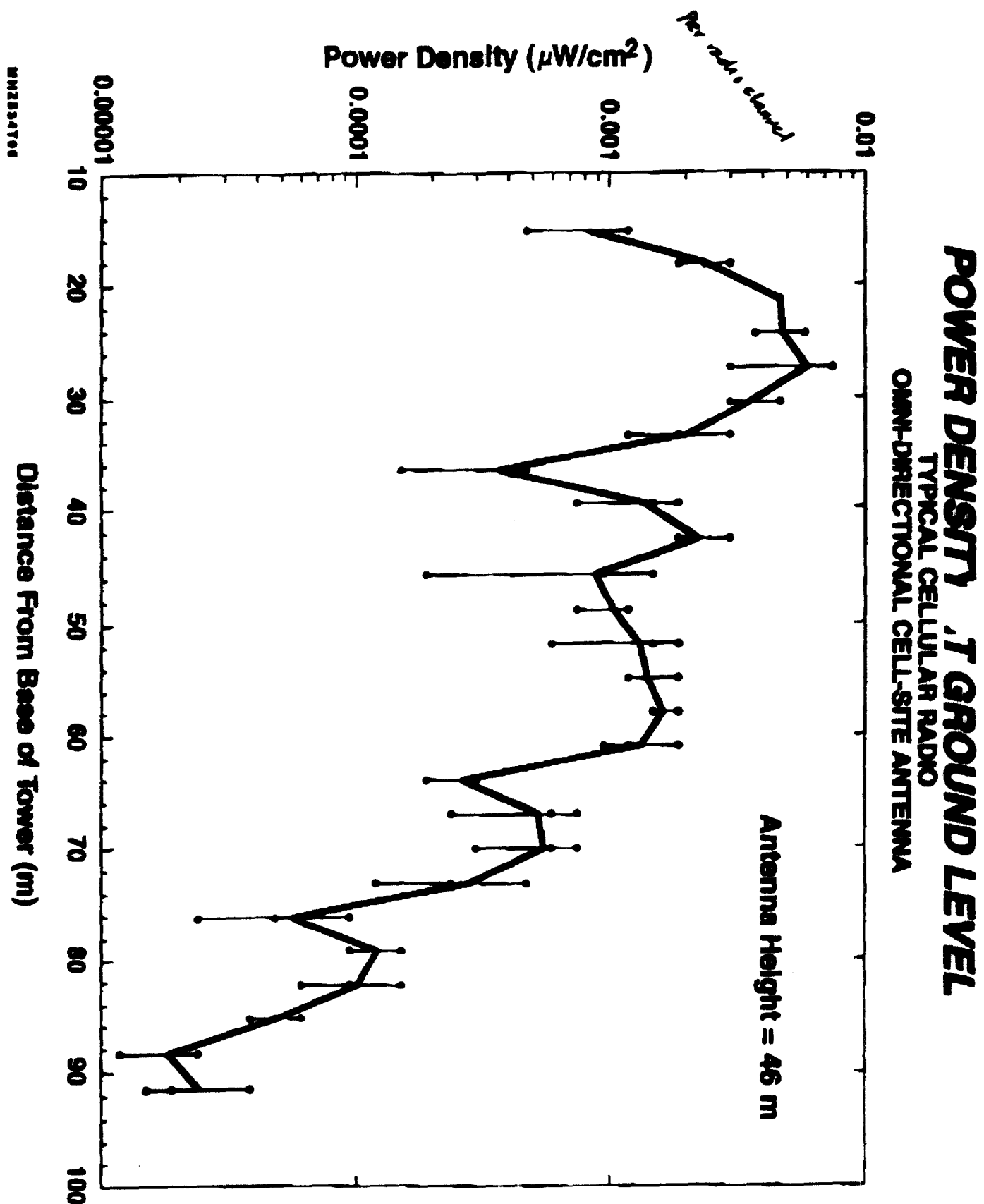
**James D. Proffitt
Director-Interconnection & Standards
PacTel Corporation**

**California Public Utilities Commission
Informational Workshop On
Cellular Transceiver Facilities**

**July 21, 1993
San Francisco, California**

POWER DENSITY AT GROUND LEVEL TYPICAL CELLULAR RADIO OMNI-DIRECTIONAL CELL-SITE ANTENNA





01/01/1995 00:14 206760000F

LAND RAK-ISHRUT

PAGE 81

Exhibit #5
for company absorbed
energy of adult man
& 6 year old child.

USAFSAM-TR-85-73

RADIOFREQUENCY RADIATION DOSIMETRY HANDBOOK

(Fourth Edition)

**Carl H. Durney, Ph.D.
Habib Massoudi, Ph.D.
Magdy F. Iskander, Ph.D.**

**Electrical Engineering Department
The University of Utah
Salt Lake City, UT 84112**

October 1986

Final Report for Period 1 July 1984 to 31 December 1985

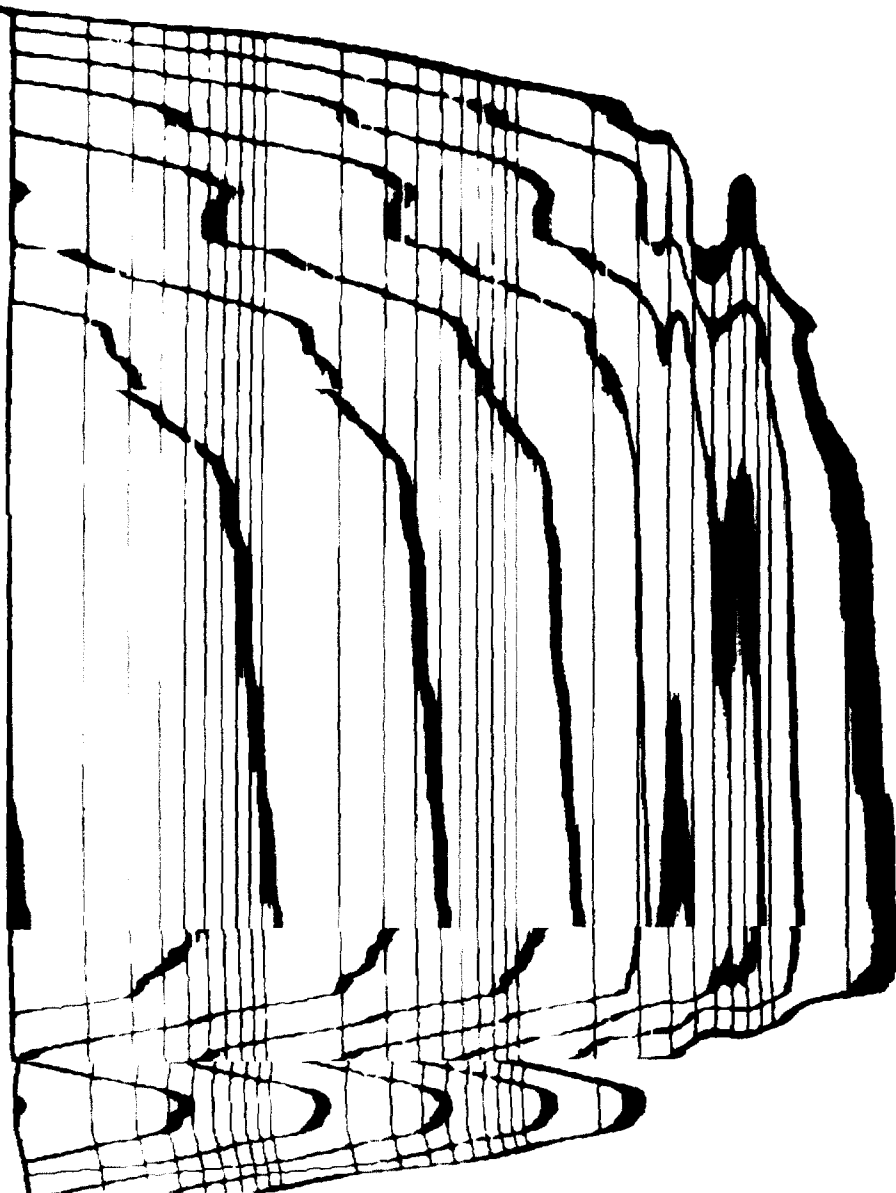
Approved for public release; distribution is unlimited.

Prepared for

**USAF SCHOOL OF AEROSPACE MEDICINE
Aerospace Medical Division (AFSC)
Brooks Air Force Base, TX 78235-5301**



10



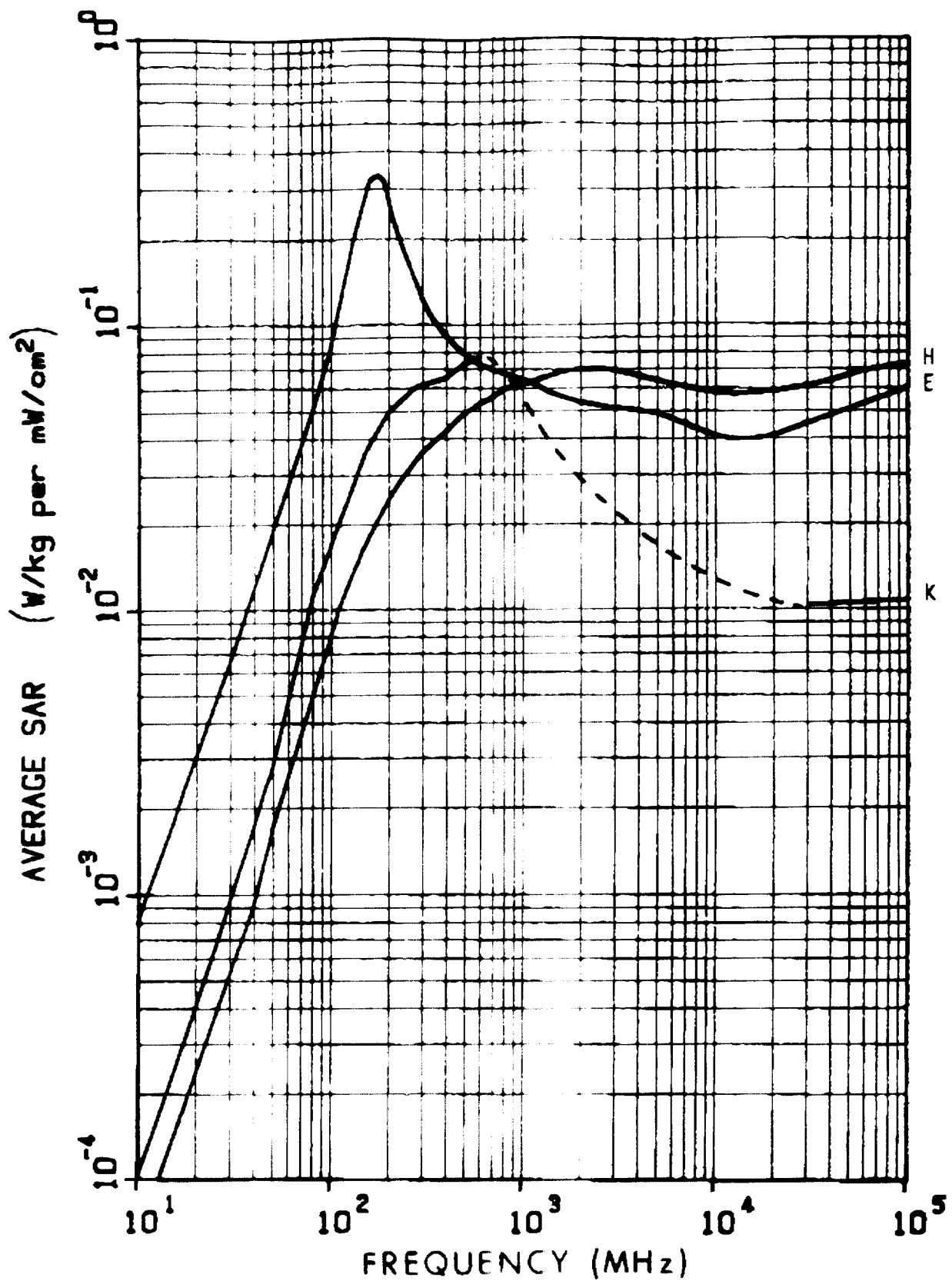


Figure 6.9. Calculated planewave average SAR in a prolate spheroidal model of a 1-year-old child for three polarizations; $a = 0.37$ m, $b = 0.08$ m, $V = 0.001$ m³. The dashed line is estimated values.

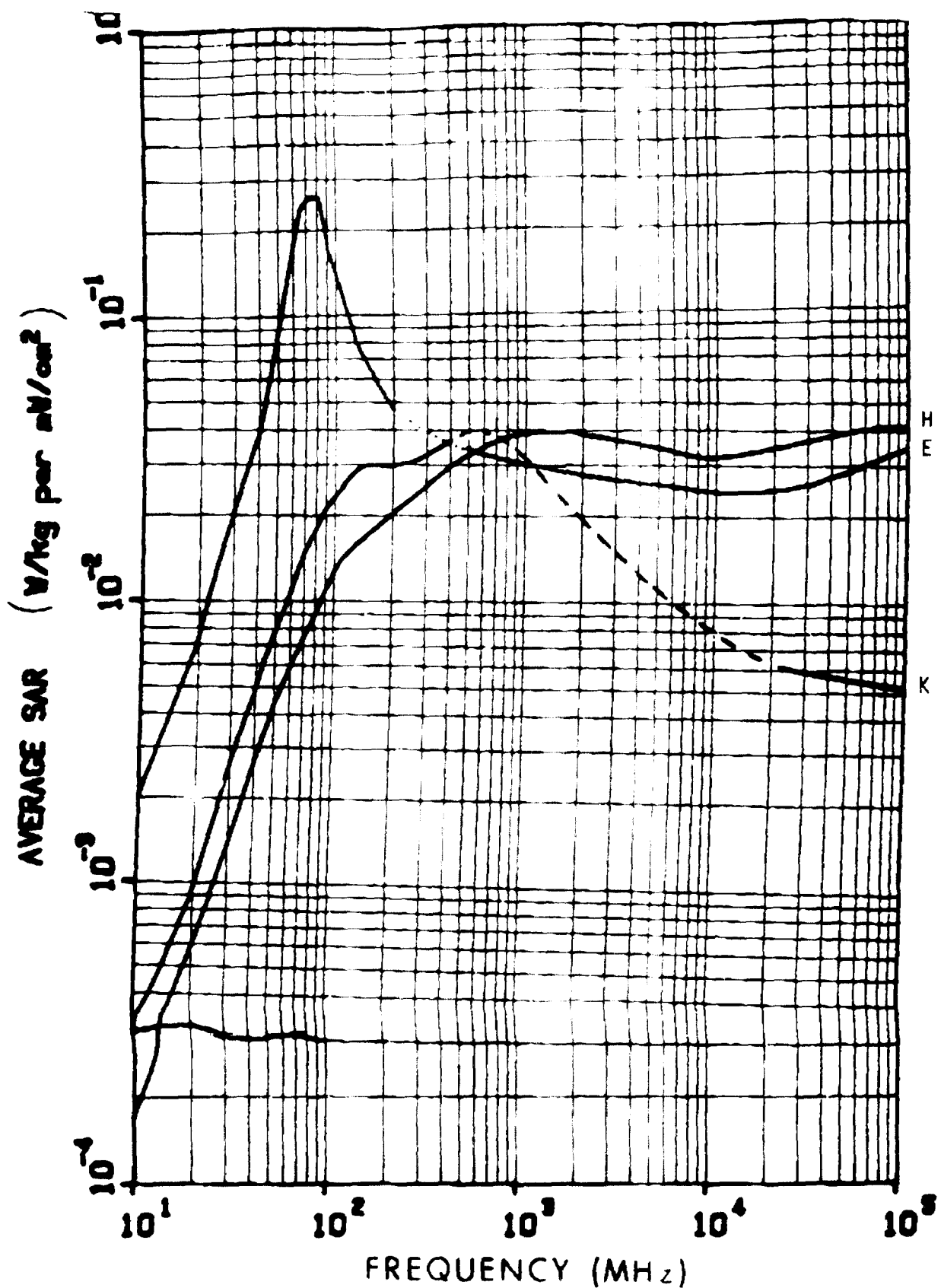


Figure 6.3. Calculated plane-wave average SAR in a prolate spheroidal model of an average man for three polarizations, $a = 0.875$ m, $b = 0.138$ m, $V = 0.07$ m³. The dotted line is calculated from Equation 5.1, the dashed line is estimated values.

Exhibit # 6

Showing how it ~~EXCEEDS~~
+ beyond
1 mW/cm² at 1500 MHz
then likely to violate
basic provisions.

How do not allow
exposure to increase
beyond 1500 MHz
for general pop.

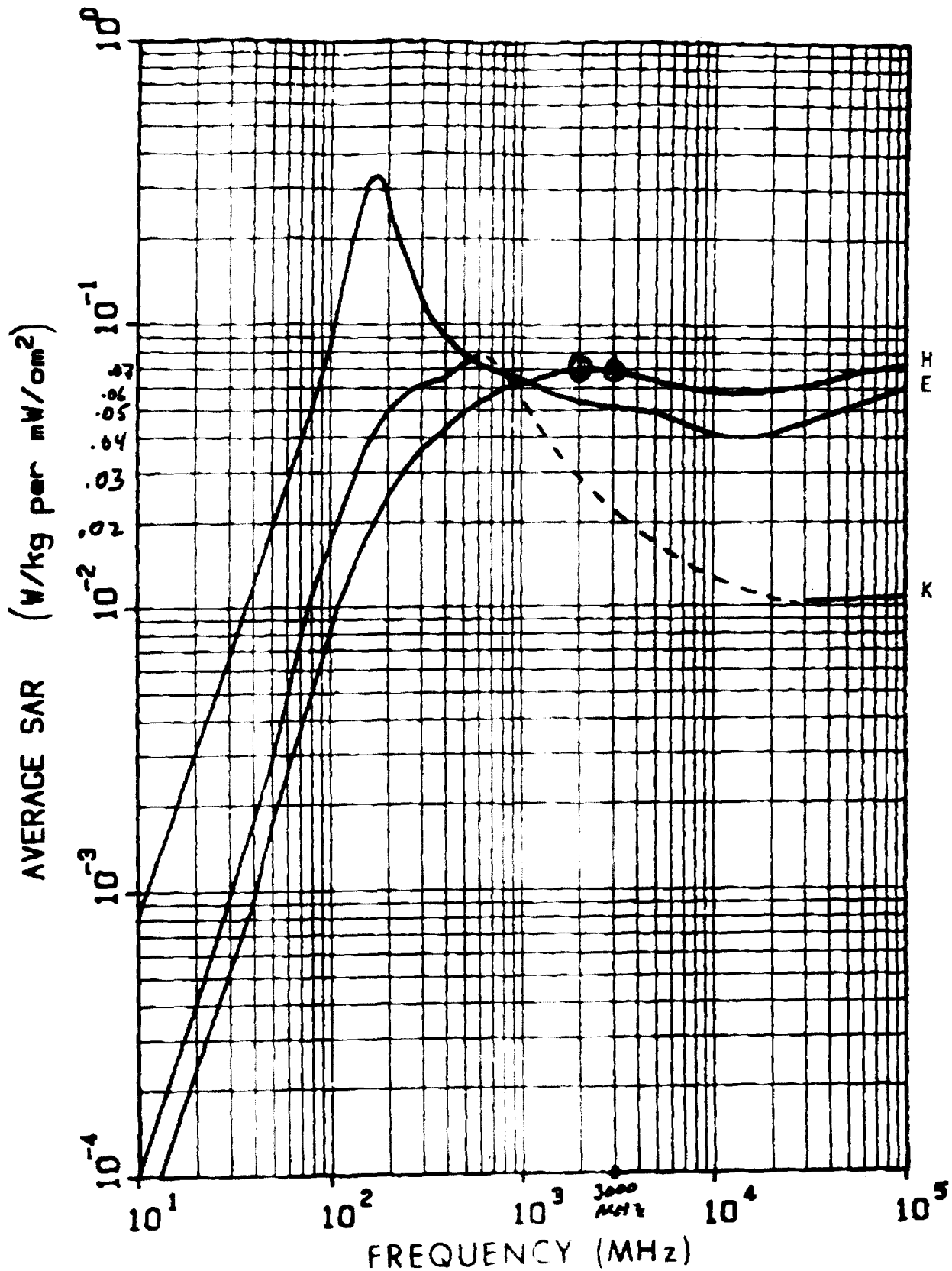


Figure 6.9. Calculated plane-wave average SAR in a prolate spheroidal model of a 1-year-old child for three polarizations; $a = 0.37$ m, $b = 0.08$ m, $V = 0.01$ m³. The dashed line is estimated values.

*Shows Standard is exceeded if use IEEE 1991 Rules.
At 3000 MHz*

if limit of power density 2 freq 1500

*Child absorbs about .07 w/kg
per each mW/cm²*

Graphs showing that the proposed IEEE C95.1-1991 (IEEE 1991) proposed increase in the frequency range above 1500 MHz is expected to violate the basic protections of the standard

Figure 11.2A is taken directly from the Radiofrequency Radiation Dosimetry Handbook, 1986, and is Figure 11.2 on page 11.3. This is the reference to which IEEE 1991 refers for those seeking further dosimetry information. Hence, IEEE 1991 accepts it as a valid reference. Figure 11.2A shows, for example, that for frequencies above 1500 MHz, a 10 kg child will reach the limit of 0.4 W/kg at just under a power density of 10 mW/sq. cm, and that persons of 32 kg and 70 kg will reach 0.4 W/kg at just over 10 mW/sq. cm. This thus shows that ANSI C95.1-1982 limit of 5 mW/sq. cm is protective above 1500 MHz of such persons exceeding the average whole body SAR limit of 0.4 W/kg.

Notice that for a 10 kg. child this limit is exceeded at 3000 MHz and above. Hence, for the less conservative tier IEEE 1991 is incompatible with its basic provisions. Since the less restrictive tier is not based on occupational exposure but on "awareness" or on being in a place of public transit, a 10 kg child waiting at a bus stop could be exposed at this level for a long time.

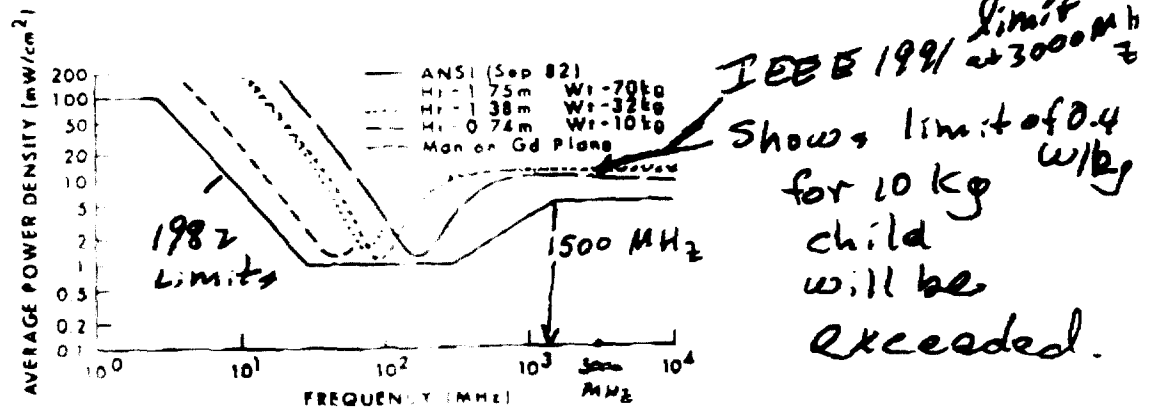


Figure 11.2A Power densities that limit human whole-body SAR to 0.4 W/kg compared to ANSI standard.

Figure 11.2B is obtained from Figure 11.2A by observing that average whole body SAR is directly proportional to power density in the range where power density is meaningful (0.1 to 6000 MHz [IEEE 1991, pg. 22]). The average whole body SAR limit for the more conservative tier of IEEE 1991 is 0.08 W/kg, which is 1/5th of 0.4 W/kg on which Figure 11.2A is based. Hence, to find the power density at which a person will exceed 0.08 W/kg, one need only divide by 5 the power density values along the vertical axis of Figure 11.2A. This is what is shown in 11.2B. For IEEE 1991 power density limits from 300 MHz to 15,000 MHz are frequency / 1500. So we obtain for 3000 MHz limit = 2 mW/sq. cm, for 4500 MHz limit = 3 W/sq. cm, and for 6000 MHz limit = 4 W/sq. cm.

It should be noticed that at least by 4500 MHz a 10 kg child is expected to exceed the IEEE 1991 average whole body SAR limit of 0.08 W/kg, and that at 6000 MHz all body sizes shown are expected to exceed an average whole body SAR limit of 0.08 W/kg. Hence, based on the reference cited by IEEE 1991, the power densities it recommends are incompatible with its basic provision not to exceed 0.08 W/kg for the more conservative tier.

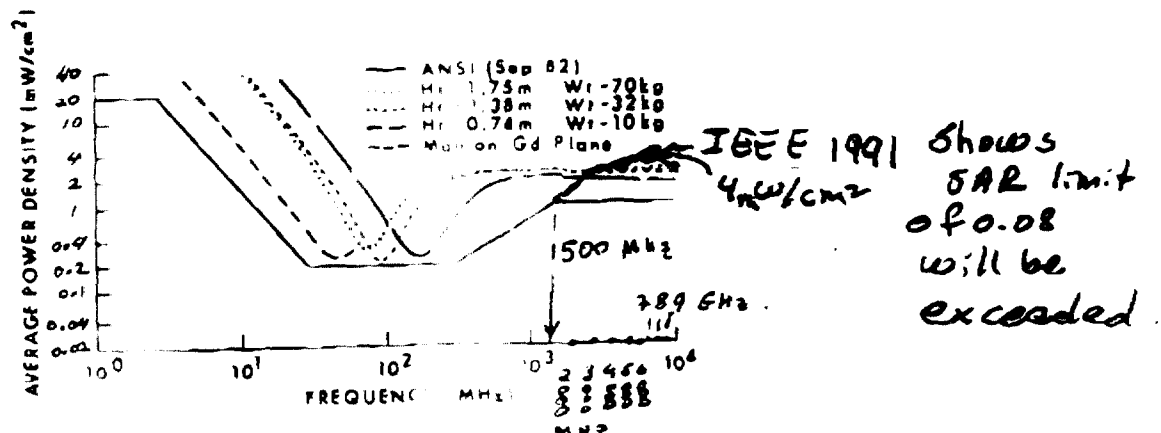


Figure 11.2B Power densities that limit human whole-body SAR to 0.08 W/kg compared to ANSI standard.

EXHIBIT #2

Concerning

- Millimeter Wave Exposure limits

- Partial Body Exposure Limits.

SPECIFIC ABSORPTION RATES AND INDUCED CURRENT DISTRIBUTIONS IN AN ANATOMICALLY BASED HUMAN MODEL FOR PLANE-WAVE EXPOSURES

from

Om P. Gandhi,* Yong-gang Gu,* Jin-Yuan Chen,* and Howard I. Bassen†

[illegible]
$$\left(\frac{363}{823}\right)^{867} = 0.829 \text{ W/Kg}$$

Values are mW/kg when incident exposure
= 1 mW/cm² each cell is

Section through the heart
(Height relative to bottom of the feet $z = 136.9$ cm)

1.31 cm³ and is about 1 gram in weight

Fig. 11p (continued). 915 MHz.

Partial Body Exposure rules of IEEE C95.1-1991 allow 4 mW/cm^2 to irradiate part of the body. Suppose it is the chest by the heart.

Then 829 mW/kg for $1 \text{ mW/cm}^2 \rightarrow 4 \times 829 \text{ mW/kg}$
 when there is 4 mW/cm^2
 $4 \times 829 \text{ mW/kg} = 4 \times 0.829 \text{ W/kg} = 3.3 \text{ W/kg}$ which
 exceeds the standard of 1.6 W/kg .

considerations may apply for multiple exposures (see 8.2.2.1).

8.2.2 Exposure Duration. For a single-pulse laser, the exposure duration is equal to the pulse duration, t , defined at its half-power points. For a cw visible (400 to 700 nm) laser, the exposure duration is the maximum time of anticipated direct exposure, T_{max} . If purposeful staring into the beam is not intended or anticipated, then the aversion response time, 0.25 s, may be used.

For non-visible wavelengths (less than 400 nm or greater than 700 nm), the cw exposure duration is the maximum time of anticipated direct exposure, T_{max} . For the hazard evaluation of retinal exposures in the near-infrared (700 to 1400 nm), a maximum exposure duration of 10 s provides an adequate hazard criterion for either unintended or purposeful staring conditions. In this case, eye movements will provide a natural exposure limitation eliminating the need for exposure durations greater than 10 s, except for unusual conditions. In special applications, such as medical instrumentation, even longer exposure durations may apply.

For repetitively pulsed lasers, the total exposure duration, T , of the train of pulses must be determined. This duration is determined in the same manner as is used for cw laser exposures. The method for determining the MPEs for repetitively pulsed laser exposures is given in 8.2.2.1 and 8.2.2.2. For pulse widths less than 1 ns, see Note in Section 8.

8.2.2.1 Repeated Exposures, Ultraviolet (315 to 400 nm) — Special Considerations. For repeated exposures, the exposure dose is additive over a 24-hour period, regardless of the repetition rate. The MPE for any 24-hour period should be reduced by a factor of 2.5 times relative to the single-pulse MPE if exposures on succeeding days are expected.

8.2.2.2 Repeated Exposures, Visible (400 to 700 nm) and Infrared (>700 nm). Both scanned cw lasers and repetitively pulsed lasers can produce repetitively pulsed exposure conditions. The MPE per pulse for repetitively pulsed intrabeam viewing is $n^{-1/4}$ times the MPE for a single pulse exposure where n is the number of pulses found from the product of the prf and the exposure duration (T) as defined in 8.2.2. (See Figure 12 for a graphical representation of $n^{-1/4}$.) This MPE applies to all wavelengths greater than

700 nm (thermal injury). For wavelengths less than 700 nm, the MPE as calculated on the basis of $n^{-1/4}$ also must not exceed the MPE calculated for nt seconds when nt is greater than 10 s.

For pulse repetition frequencies greater than 15 kHz, the average irradiance or radiant exposure (radiance or integrated radiance) of the pulse train shall not exceed the MPE (as given in 8.2) for a single pulse equal in duration to the pulse train duration, T .

For wavelengths between 400 and 700 nm, the aversion response time, 0.25 s, may be used unless purposeful staring into the beam is intended or anticipated. For wavelengths greater than 700 nm, 10 s may be used as the exposure duration unless purposeful staring into the beam is intended or anticipated.

8.3 MPE for Extended-Source Viewing. MPE values for ocular exposure to extended sources for single pulses or exposures are given in Table 6. All values are specified at the cornea. (See 8.5 for special qualifications and use; see also Figs. 5, 6, and 7.) For multiple pulse lasers or exposures, the MPE is determined using the exposure time of the pulse train duration, T .

8.4 MPE for Skin Exposure to a Laser Beam. MPE values for skin exposure to a laser beam are given in Table 7. These levels are for worst-case conditions and are based on the best available information.

8.4.1 MPE for Skin, Repeated Exposures. For repetitive-pulsed lasers the MPEs for skin exposure are applied as follows: Exposure of the skin shall not exceed the MPE based upon a single-pulse exposure, and the average irradiance of the pulse train shall not exceed the MPE applicable for the total pulse train, duration T . (See 8.5 for special qualifications and uses.)

8.4.2 Wavelengths Greater than 1.4 μ m. For beam cross-sectional areas between 100 cm² and 1000 cm², the MPE for exposure durations exceeding 10 s is $10,000/A$, mW/cm², where A is the area of the exposed skin in cm². For exposed skin areas exceeding 1000 cm², the MPE is 10 mW/cm².

8.5 Special Qualifications — Infrared. Available data is not sufficient to define wavelength corrections relative to 1.06 μ m over the entire infrared range (1.4 μ m to 1 mm). At 1.54 μ m,

FOR
Partial Body

IEEE 1991
allows up to 40 mW/cm²

at higher frequencies

(5) Gases of different categories (toxics, corrosives, flammable, oxidizers, inert, high pressure, and cryogenics) not stored separately in accordance with OSHA and Compressed Gas Association requirements.

7.8 Laser Dyes. Laser dyes are complex fluorescent organic compounds which, when in solution with certain solvents, form a lasing medium for dye lasers. Certain dyes are highly toxic or carcinogenic. Since these dyes frequently need to be changed, special care must be taken when handling, preparing solutions, and operating dye lasers. A MSDS for dye compounds shall be available to all appropriate workers.

The use of dimethylsulfoxide (DMSO) as a solvent for cyanine dyes in dye lasers should be discontinued if possible. DMSO aids in the transport of dyes into the skin. If another solvent cannot be found, low permeability gloves should be worn by personnel any time a situation arises where contact with the solvent may occur.

Dye lasers containing at least 100 milliliters of flammable liquids shall be in conformance with the provisions of the NFPA (NFPA 30, 45, and 99), and the NEC (Article 500 - Hazardous (classified) Locations).

7.9 Mechanical Hazards Associated with Robotics. In many industrial applications lasers are employed in conjunction with robots. In these situations, the mechanical safety of the robot installation must be carefully considered.

A number of accidents have occurred where a worker has been pinned between a robot and a confining object ("pinch effect"). The LSO should ensure that approaches to prevent these types of accidents are in place. These approaches may include the use of surface interlock mats, interlocked light curtains, or non-rigid walls and barriers. The installation should conform to recommendations contained in the document ANSI/RIA R15.06-1986 *Standard for Industrial Robots and Robot Systems-Safety Requirements* or latest revision thereof.

7.10 Noise. Noise levels from certain lasers, such as excimer lasers, may be of such intensity that noise control may be necessary. Consult the US Department of Labor, Occupational Safety and Health Administration Regulations and the ACGIH TLVs.

7.11 Waste Disposal. Proper waste disposal of contaminated laser-related material, such as flue and smoke filters, organic dyes, and solvent solutions shall be handled in conformance with appropriate local, state, and federal guidelines.

7.12 Confining Space. In many laser system installations, space is at a minimum. Confining space can be a problem when working around high voltage equipment (see the National Electric Code, Section 110-16). There must be sufficient room for personnel to turn around and maneuver freely. This issue is compounded when more than one type of laser is being operated at the same time. Whenever lasers or laser systems are used in confining space, local exhaust, mechanical ventilation and respiratory protection shall be used if LGAC's are present.

7.13 Ergonomics. Ergonomic problems can exist in certain laser operations that can cause unique arm, hand, and wrist deviations. If such repetitive deviations occur for long periods of time medical problems such as carpal tunnel syndrome can arise. The LSO should be aware of this problem and become familiar with appropriate user control measures.

8. Criteria for Exposures of Eye and Skin

Maximum permissible exposure (MPE) values are below known hazardous levels. Exposure to levels at the MPE values given may be uncomfortable to view or feel upon the skin. Thus, it is good practice to maintain exposure levels as far below the MPE values as is practicable.

A limiting aperture shall be used for measurements or calculations with all MPE values. This limiting aperture is required, because the MPE has been expressed (normalized) relative to the limiting aperture area. The limiting aperture is the maximum circular area over which irradiance and radiant exposure can be averaged (see Sections 3 and 9 for selection and application of the appropriate aperture).

The irradiance values for the MPEs in Table 5 can be obtained by dividing the radiant exposure by the exposure duration, t , in seconds. Values for the radiant exposure can be obtained by multiplying the irradiance by the exposure duration, t , in seconds (Appendix G provides reference material on this subject).

*This applies to the exposure at higher frequencies of IEEE1991
Does the commission want the
general public to feel uncomfortable?*

applicable for a 0.07 s exposure. For exposure durations longer than 0.7 s, the MPE should be reduced by a factor of 5.4 for wavelengths between 0.4 and 0.6 μm , and by a factor, $10^{7.4(0.7-\lambda)}$ for wavelengths between 0.6 and 0.7 μm .

When the eye is immobilized or otherwise constrained so that the image on the retina is stabilized and the exposure duration is longer than 3.2 s, both the intrabeam viewing and the extended source exposure are limited to $20 C_B \text{ J}/(\text{cm}^2 \text{ sr})$ averaged over 1.5 mrad.

8.4 MPE for Skin Exposure to a Laser Beam. MPE values for skin exposure to a laser beam are given in Table 7. These levels are for worst-case conditions and are based on the best available information.

8.4.1 MPE for Skin, Repeated Exposures. For repetitively pulsed lasers the MPEs for skin exposure are applied as follows: Exposure of the skin shall not exceed the MPE based upon a single-pulse exposure, and the average irradiance of the pulse train shall not exceed the MPE applicable for the total pulse train, duration T.

8.4.2 Wavelengths Greater than 1.4 μm . For beam cross-sectional areas between 100 cm^2 and 1000 cm^2 , the MPE for exposure durations exceeding 10 s is $10,000/A, \text{ mW}/\text{cm}^2$, where A, is the area of the exposed skin in cm^2 . For exposed skin areas exceeding 1000 cm^2 , the MPE is $10 \text{ mW}/\text{cm}^2$.

9. Measurements

9.1 General. The laser classification scheme described in Section 3 is designed to minimize the need for laser measurements and calculations by the user. Generally, such measurements are required only when manufacturer's information is not available, when the laser or laser system has not been classified by the manufacturer in accordance with the Federal Laser Products Performance Standard, or when alterations to a system may have changed its classification.

The cumulative error due to all sources of inaccuracy (both systematic and statistical), including human factors, operating conditions, and instrumental errors, shall not exceed $\pm 20\%$, or, if this is not possible, the best that the state of the art reasonably will permit. It is important to recognize that measurements

improperly performed may be worse than no measurements, since they may imply a safe condition that does not actually exist. Experience has shown that measurement errors well in excess of $\pm 20\%$ are commonly made and often are unidentified.

If measurements are performed, the accuracy of the instrumentation should be traceable to national standards, either directly to the National Institute of Science and Technology (NIST) or to other transfer standards traceable to NIST. The NIST conducts programs for assistance in meeting these requirements. (See references in H4.)

Measurements should be attempted only by personnel trained or experienced in laser technology and radiometry. Routine survey measurements of lasers or laser systems are neither required nor advisable when the laser classifications are known and the appropriate control measures implemented.

If a laser or laser system is used outdoors over long ranges, where the uncertainties of propagation influence exposures, or where the beam divergence is uncertain, measurements may be useful.

Measurements shall be made with the laser adjusted for maximum output for the intended use.

9.2 Intrabeam and Extended-Source Measurements. If measurements or calculations are required, distinction shall first be made between intrabeam viewing and extended-source viewing in the 0.4 to 1.4 μm wavelength region. For the purpose of this standard, an extended source subtends an angle at the observer's eye greater than the angular subtense, α_{\min} , (shown in Fig. 3), across the smallest angular dimension of the source as viewed by the observer.

9.2.1 Radiance. The maximum radiance of an extended source, such as the scattering of a laser beam from a diffuse surface, shall be determined by measurement. The measurement may average over the appropriate conical field of view defined by the angular subtense, α_{\min} , or over a 1 mm diameter circular area, whichever gives the larger value of radiance. In the case of nonuniform extended-source profiles, such as those resulting from inhomogeneous beams or "hot spots," the measurement shall be taken from the regions of greatest radiance.

9.2.2 Irradiance or Radiant Exposure.

9.2.2.1 Limiting Aperture. The measurement of irradiance or radiant exposure shall be made with instruments that average over circular areas defined by the effective limiting aperture diameters given in

Exhibit 8

Shows IEEE
Magnetic Limits
Field
are ~~too~~
much higher
than DRPA
for some
cases.

Don't

Raise Magnetic Field
Limits.

Set Limits .003 - .1 to
same value as at .1.
OR Less.

Exposure standards IRPA 1988

average SAR might not exceed 0.4 W/kg, several reports indicated that, under certain conditions, local peak SARs in the extremities

Table 34. IRPA occupational exposure limits for RF fields^a

Frequency range (MHz)	Unperturbed rms electric field strength (V/m) ^b	Unperturbed rms magnetic field strength (A/m) ^b	Equivalent plane-wave power density (W/m ²) ^b (mW/cm ²) ^b	
0.1-1	614	1.61		
> 1-10	614/f	1.6/f		
> 10-400	61	0.16	10	1
> 400-2000	3/f ^{0.5}	0.0087f ^{0.5}	1/40	1/400
> 2000-300 000	137	0.38	50	5

^a From: IRPA (1988a).
^b f = frequency in MHz.

Note: Hazards of RF burns should be eliminated by limiting currents from contact with metal objects. In most situations, this may be achieved by reducing the E values from 614 to 194 V/m in the range from 0.1 to 1 MHz and from 614/f to 194/f^{0.5} in the range from > 1 to 10 MHz.

Table 35. IRPA general population exposure limits for RF fields^a

Frequency range (MHz)	Unperturbed rms electric field strength (V/m) ^b	Unperturbed rms magnetic field strength (A/m) ^b	Equivalent plane-wave power density (W/m ²) ^b (mW/cm ²) ^b	
0.1-1	87	0.23/f ^{0.5}		
> 1-10	87/f ^{0.5}	0.23/f ^{0.5}		
> 10-400	27.5	0.073	2	0.2
> 400-2000	1.375f ^{0.5}	0.0037f ^{0.5}	1/200	1/2000
> 2000-300 000	61	0.16	10	1

^a From: IRPA (1988a).
^b f = frequency in MHz.

when f=1 $0.23/f^{0.5} = .23$

Magnetic field comparison between the RF 1988 standard of the International Radiation Protection Association and the RF 1991 standard of the Institute of Electrical and Electronic Engineers (IEEE) shows that at 1 MHz: 10 fold higher limits are found for IEEE than IRPA for 'occupational' exposure 70 fold higher limits are found for IEEE than IRPA for 'general population exposure'

Maximum Permissible Exposure (MPE) for Controlled Environments

Electromagnetic Fields (controlled environments)

Frequency Range (MHz)	Electric Field Strength E (V/m)	Magnetic Field Strength H (A/m)	Power Density (S) E-field; H-field (mW/cm ²)
0.003-0.1	614	163	(100; 1,000,000)*
0.1-3.0	614	16.3/f	(100; 10,000/f ²)*
3.0-30	1842/f	16.3/f	(900/f ² ; 10,000/f ²)*
30-100	61.4	16.3/f	(1.0; 10,000/f ²)*
100-300	61.4	0.163	1.0
300-3000	--	--	f/300
3000-15,000	--	--	10
15,000-300,000	--	--	10

Notes: f = frequency in megahertz (MHz)

E = electric field

H = magnetic field

V/m = volts per meter

A/m = amperes per meter

mW/cm² = milliwatts per centimeter squared

for f=1 $16.3/f = 16.3$

$16.3 / 1.6 = 10$

Maximum Permissible Exposure (MPE) for Uncontrolled Environments

Electromagnetic Fields (uncontrolled environments)

Frequency Range (MHz)	Electric Field Strength E (V/m)	Magnetic Field Strength H (A/m)	Power Density (S) E-field; H-field (mW/cm ²)
0.003-0.1	614	163	(100; 1,000,000)*
0.1-1.34	614	16.3/f	(100; 10,000/f ²)*
1.34-3.0	823.8/f	16.3/f	(180/f ² ; 10,000/f ²)*
3.0-30	823.8/f	16.3/f	(180/f ² ; 10,000/f ²)*
30-100	27.5	158.3/f ^{1.668}	(0.2; 940,000/f ^{2.336})*
100-300	27.5	0.0729	0.2
300-3000	--	--	f/1500
3000-15,000	--	--	f/1500
15,000-300,000	--	--	10

Notes: f = frequency in megahertz (MHz)

E = electric field

H = magnetic field

V/m = volts per meter

A/m = amperes per meter

mW/cm² = milliwatts per centimeter squared

when f=1 $16.3/f = 16.3$

$16.3 / .23 = 70$

Vol. 11, No. 7, 1992 or papers NOT referenced
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"Amplitude Modulated Fields"

Biological effects have been observed at RF and MW fields amplitude modulated at ELF at SAR levels below thresholds for effects of continuous waves. Many of these effects are the same or similar to effects observed for ELF electric and magnetic fields. The observed effects are usually field frequency and intensity specific, tend to occur within relatively narrow ranges of both field parameters, and are dependent on other physical and physiological characteristics of the exposed biological system. Many of these parameters have not been fully identified and characterized. The interaction mechanisms remain unknown. The scientific literature database is relatively limited in this area. However, the potential importance of these effects should not be overlooked for two reasons. First, the scientific evidence with respect to health effects of ELF fields while still inconclusive, is suggestive of possible detrimental effects. Second, until the recent developments in digital communication, hardly any situations of human exposure to RF/MW fields deeply amplitude modulated at ELF occurred. This situation is going to change rather rapidly with expansion of wireless digital communication." [page 330]

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R₁

symposium was funded by Wireless Technology Research, L.L.C (limited liability company). For copies contact Federal Focus, Inc. 11 Dupont Circle, NW, Washington DC, 20036, Tel: (202) 797-6368, Fax: (202) 939-6969

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CERTIFICATION OF ENROLLMENT
ENGROSSED SUBSTITUTE HOUSE BILL 2828

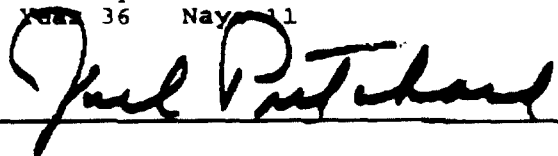
54th Legislature
1996 Regular Session

Passed by the House March 6, 1996
Yeas 71 Nays 23



Speaker of the
House of Representatives

Passed by the Senate March 7, 1996
Yeas 36 Nays 11




President of the Senate

Approved

Governor of the State of Washington

CERTIFICATE

I, Timothy A. Martin, Chief Clerk of the House of Representatives of the State of Washington, do hereby certify that the attached is ENGROSSED SUBSTITUTE HOUSE BILL 2828 as passed by the House of Representatives and the Senate on the dates hereon set forth.



Chief Clerk

FILED

Secretary of State
State of Washington